Nanostructured Ultrathin Polymer Films Based on the Layer-by-Layer Deposition Approach

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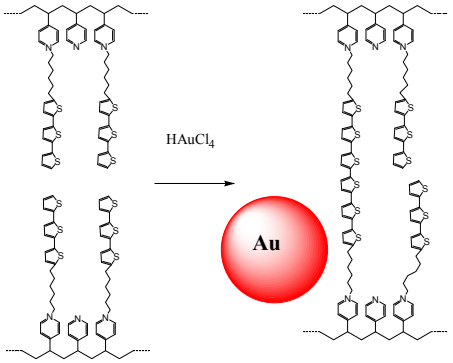
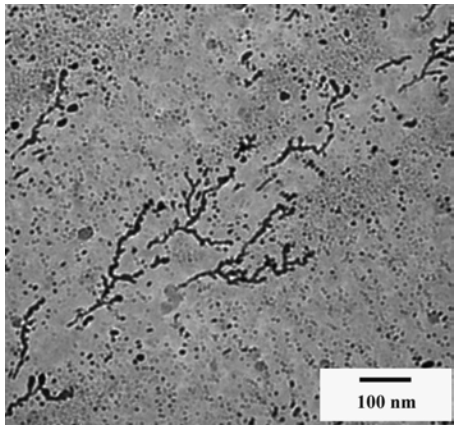
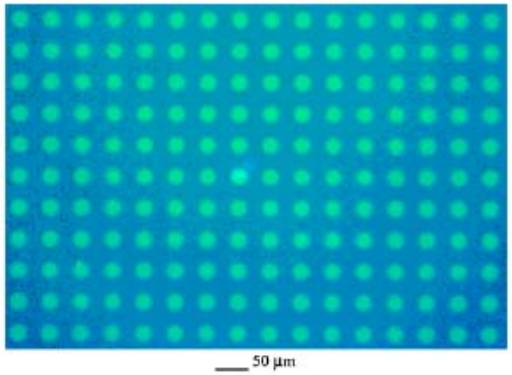
We have been investigating the formation of nanostructured polymer ultrathin films based on the layer-by-layer deposition of polyelectrolyte materials. Recently we have investigated the simultaneous formation of metal nanoparticles based on the oxidative coupling of terthiophene functional groups (to form sexithiophene) tethered to a polyvinyl pyridine backbone.[1] This interesting "twist" gives the ability to form *in-situ* nanocomposite structures of hybrid organic-inorganic materials for electro-optical applications. Another project involved the formation of micropatterned electrochemically deposited precursor polymers on Au and ITO substrates.[2] We have also investigated the incorporation of the TiOx sol-gel technique with the layer-by-layer deposition of electro-optically active dyes and polyelectrolytes on ITO substrates.





Formation of Au Nanoparticles and dendrites in H-bonded P4VP-terthiophene complex in an LBL Ultrathin Film



Electrochemical deposition of polyfluorenes on a micropatterned substrate using the precursor polymer approach.

[1] *Chemistry of Materials, in press (2004)*

[2] *Chem. Mater.* **2004**;*16(15);* 2852-2856.

Materials Education and Outreach

Rigoberto Advincula, University of Houston and University of Alabama at Birmingham, NSF-DMR-99-082010

Education:

Recently, under this grant, three students have completed their Ph.D. degrees: Dr. Chuanjun Xia (post-doc at Ohio State University). Dr. Xiaowu Fan (post-doc at Northwestern Univ. and Dr. Mi-Kyoung Park (post-doc, University of Chicago); two post-doctoral scientists have been trained: Dr. Ken Onishi and Dr. Akira Baba (University of Houston); four REU undergraduate students have also participated: Mr. Hilary Spencer, Mr. Andy Prussia, Mr. Matthew Meredith and Ms. Yu Xin; two Ph.D. graduate students: Jason Locklin (4th year), Mr. Derek Patton (3rd year) have been involved with this project. To date a total of 9 undergraduates, 5 graduate students, and 3 post-docs, have benefited from the project.

Outreach:

Since 2000, in collaboration with Alabama Project SEED, we have had an annual Summer Research Camp where high school students and a high school teacher (Mr. Wally Blanton) from Montevallo High School have participated in our mentoring activities (picture below). We focus on mentory students from under-representative minority groups. This was done both at UH and UAB. To date, a total of 10 high school students have benefited from our outreach activities.